

1977

SWAN LAKE NATIONAL WILDLIFE REFUGE
Sumner, Missouri

ANNUAL NARRATIVE REPORT
Calendar Year 1977

NATIONAL WILDLIFE REFUGE SYSTEM
Fish and Wildlife Service
U.S. DEPARTMENT OF THE INTERIOR

Refuge Manager, Swan Lake NWR
Sumner, Missouri

3/30/78

Assistant Area Manager, Area 3
North Kansas City, MO (RW)

Annual Narrative Report -- 1977

A fine report that could have been terrific if a few photos had been planned and included.

Your discussion of the goose flock and the farming program is good and should be informative to RO and WO staffs.

FY'78 funding could have been shown since it started in calendar year '77.

I'm surprised you would conduct "a minimum amount of enforcement work." Maybe I don't realize how much state people are on the refuge. I think we should be doing some enforcement work.

Also, I think some off-refuge programs should be given to groups.

A list of YCC accomplishments would help the format. I suggest you require the 1978 Camp Director to prepare a list of accomplishments before he leaves so you'll have it for next year's narrative.

It is a pleasure to read such clean typing with perfect spelling and grammar (so far as I can tell).

JWS:cpb



February 1978

HL Weger

Personnel

1. Alfred O. Manke, Refuge Manager, GS-485-12, Permanent Full-time 8/8/71
2. Janis A. Turner, Clerk-typist, GS-322-4, Permanent Part-time 7/19/76
3. Bennie M. Hull, Bio. Tech., GS-404-7 Permanent Full-time 8/2/65
4. Harold C. Milligan, Tractor Oper., WG-5705-6, Permanent Full-time 5/14/75
5. Larry T. Keck, Refuge Manager, GS-485-7, Permanent Full-time 10/1/72 - 11/19/77
6. Stuart L. Burnside, Tractor Oper., WG-5705-6, Full-time Furlough 4/7/72 - 12/31/77 (Furloughed)
7. Ervin Windsor, Tractor Oper., WG-5705-6, Full-time Furlough 9/28/52 - 10/22/77 (Furloughed)

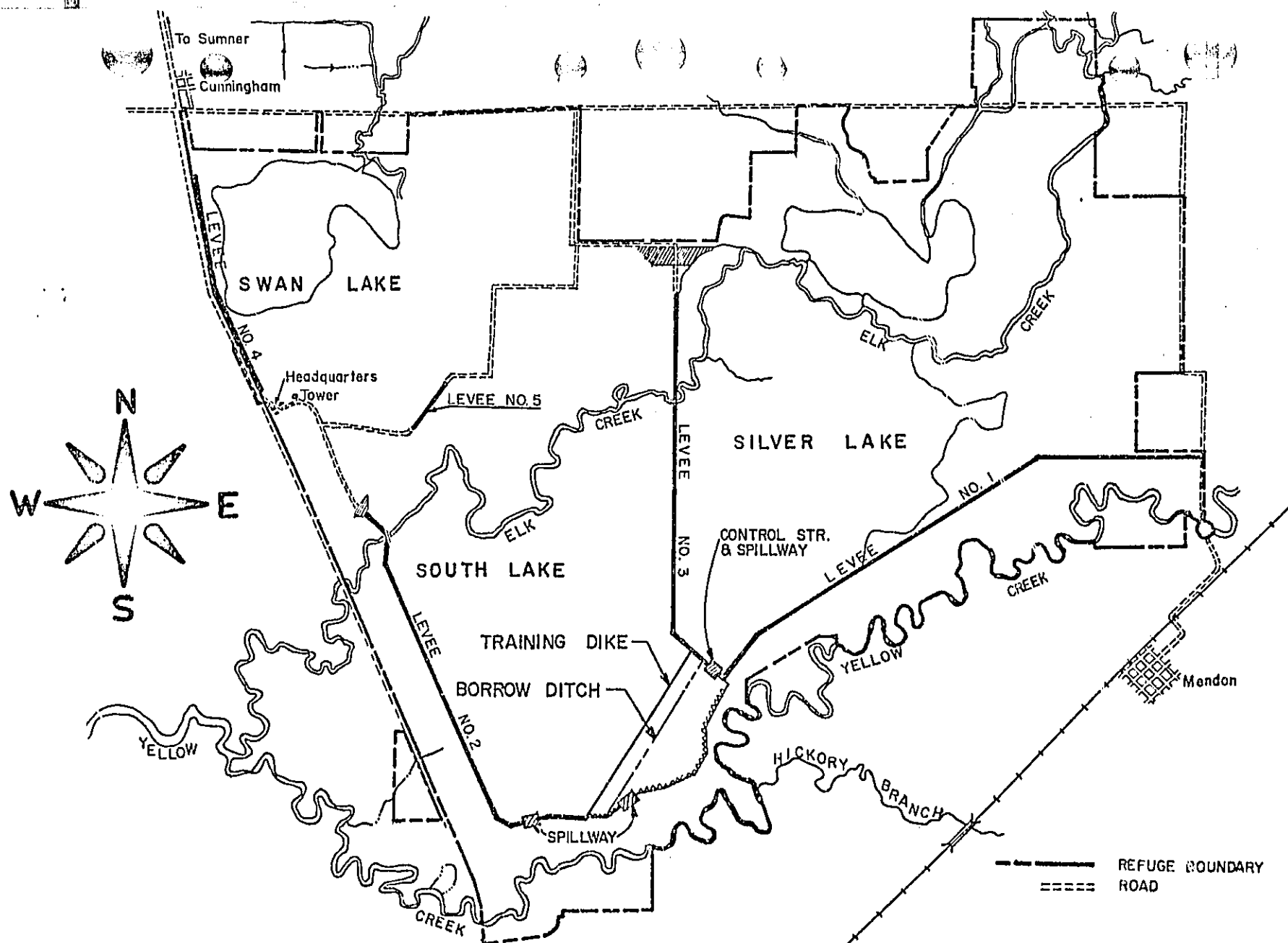
Review and Approvals

Alfred O. Manke 2/16/78
Submitted by Date

James M. Salyer 3/27/78
Area Office Date

Swan Lake NWR, Missouri
Refuge

Regional Office Date



SWAN LAKE N.W.R.

D.E.C. - MO. - 201-17.0

SWAN LAKE

NATIONAL WILDLIFE REFUGE



Swan Lake National Wildlife Refuge, comprising 11,000 acres in north-central Missouri, was established in 1937. It serves as a feeding and resting area for one of the largest single concentrations of Canada geese in North America, which at times, during the fall migration, exceeds 130,000 birds. Thousands of other waterfowl and waterbirds also obtain food and shelter here during migration. This area is administered by the U. S. Fish and Wildlife Service in the Department of the Interior.

The major development work on the refuge was begun in 1937 by the Civilian Conservation Corps and continued until 1940. Levees and control structures were built, land was cleared for crops, roads were built, buildings were constructed, and many other details vital to proper management were provided. These projects have developed croplands on about 3,000 acres and have improved approximately 5,000 acres of marsh.



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
Bureau of Sport Fisheries and Wildlife



Crops consist mainly of corn, milo, soybeans, domestic rice, and winter wheat or winter rye for green browse. Most of this acreage is farmed on a share basis by neighboring farmers, although both the refuge and State handle certain farm units with their own personnel and equipment. The initiation of wise land-use practices and modern farming methods has produced thousands of bushels of grain crops for waterfowl feeding. Considerable acreages are also devoted to clovers and grasses to supply additional green browse for geese. Other management practices which were inaugurated included the control of predators, suppression of fires, and the planting of trees and shrubs to provide food and cover for upland game birds.

Waterfowl and waterbirds of all kinds responded quickly to the newly created marsh areas. During the fall of 1938, a peak of 6,000 waterfowl was observed. By 1950, Canada geese had increased to an estimated 32,000, snow and blue geese to 5,000, and ducks numbered 160,000. Since then, the goose populations have increased yearly and have exceeded 130,000 birds, many of which spend the entire winter on the refuge. The average annual peak of Canada geese is approximately 70,000 birds. The sound of thousands of geese feeding in a field is never forgotten once it is heard. The dull roar produced during this activity can be heard for over a mile.

In order to determine the effects of refuge management upon waterfowl, and to study the many factors affecting a specific species, a banding program was initiated. This ultimately led to the development of the "Cannon Net Trap," which allowed the trapping of geese. Prior to the development of this trap, few geese had been banded and little was known about their migration, mortality, production, and other aspects of their life cycle and response to management. Through this type of trapping, it also became possible to fluoroscope large numbers of geese with a minimum of manpower. In this operation, the live goose is actually X-rayed and a record obtained of the number and size of lead shot imbedded in the body of the bird. Statistical studies and analyses of these records have been of value in determining the hunting pressure and crippling rate on the goose flock using the Swan Lake Refuge.

As these spectacular flights and concentrations continued, it was natural that hunting in the immediate area and along refuge boundaries would improve. This tremendous hunting opportunity provided management problems to be worked out by both Federal and State conservation agencies. The U. S. Fish and Wildlife Service and the Missouri Conservation Commission cooperated in a management plan whereby a strip of refuge land about a quarter-mile wide was opened entirely around the refuge boundaries. Within this area, the general public is allowed to hunt in pits especially constructed and located for hunting geese. Applicants for hunting must write to the Missouri Conservation Commission field office located on the refuge. Pits and hunting days are assigned to the applicants through an impartial lottery system.

Federal and State wildlife biologists determine the daily take of geese in and adjacent to the refuge. At such time as the "kill" approaches a calculated allowable figure, hunting is stopped by joint agreement of the Service and Commission. Under the cooperative agreement, the two agencies also work together on other management programs.

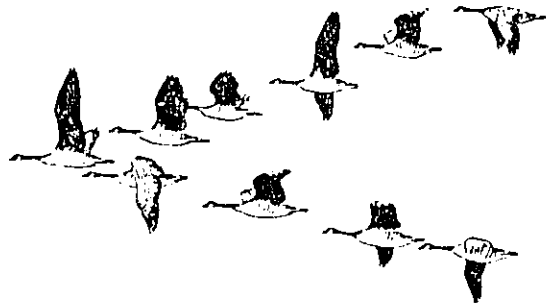
Many other kinds of wildlife have taken advantage of the refuge food, cover, and protection. Over 210 species of birds have been identified on the refuge, and copies of the birdlist are available at refuge headquarters. Included are many kinds of waterfowl which are present during the spring and fall flights.

Probably the most important secondary objective of the refuge is the preservation of some of the small remnant flocks of prairie chickens (pinnated grouse) found in this section of Missouri. This once plentiful species is gradually vanishing from the fauna of the Plains States.

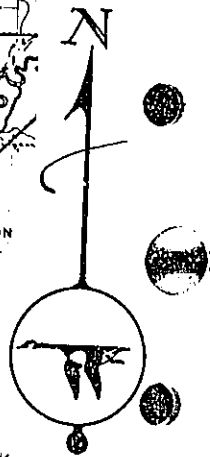
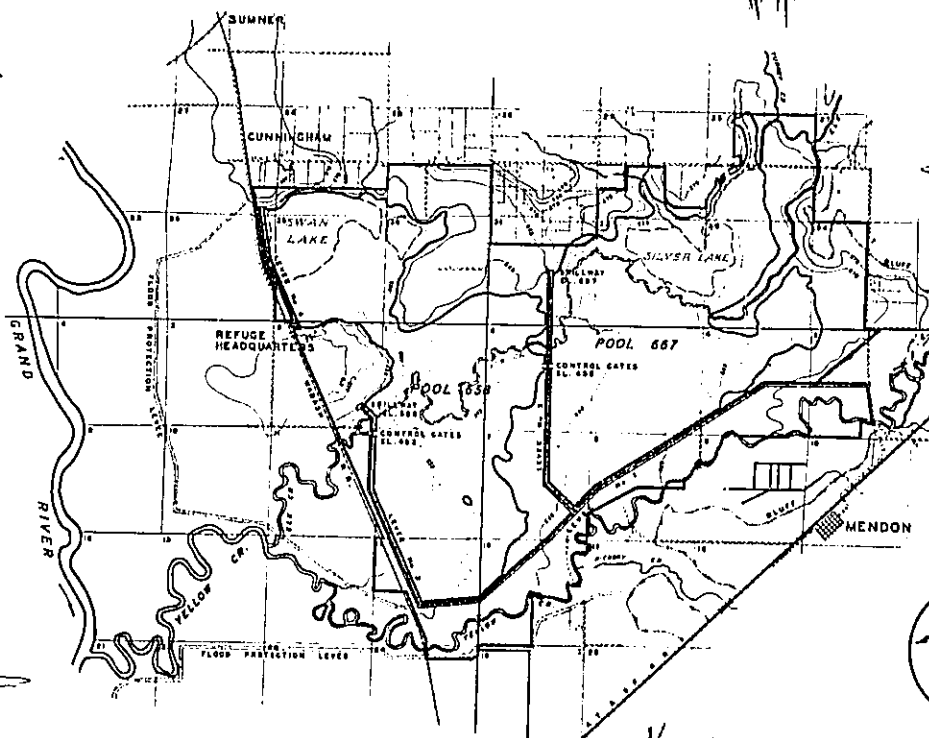
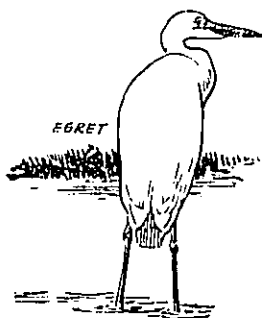
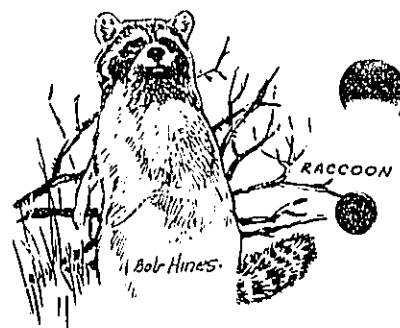
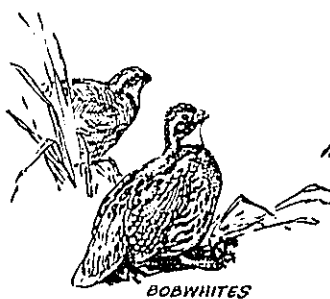
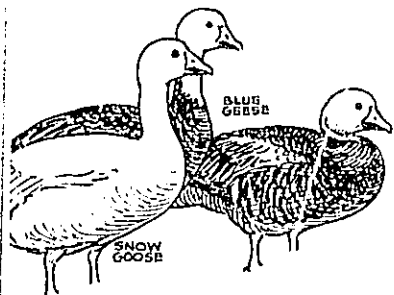
A part of the refuge is opened to the public for fishing during the period of May 1 to September 15. Channel catfish, bullhead, carp, and drum are taken frequently, and the ever-present carp and buffalo are removed in large numbers by special seining regulations. All fishing is in accordance with State regulations.

The most spectacular goose flights occur during late October and early November. The public is encouraged to plan trips during the period from October 1 through November 15 in order to see the large flights to best advantage. A graveled road leads directly to the 100-foot observation tower at refuge headquarters. From the tower, it is possible to look out over a large expanse of field and marsh on which the geese feed and rest.

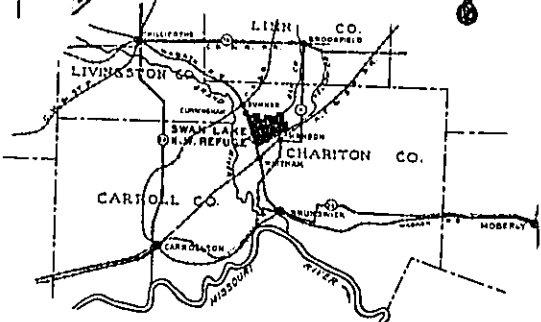
Swan Lake National Wildlife Refuge may be reached from U. S. Highway 36 (between Chillicothe and Brockfield) by going south on State Highway 139 to Sumner. The main refuge entrance is one mile south of Sumner. Inquiries may be addressed to the Refuge Manager, Swan Lake National Wildlife Refuge, Sumner, Missouri.



RL-53-R
December 1963



SWAN LAKE
NATIONAL WILDLIFE REFUGE



LOCATION MAP

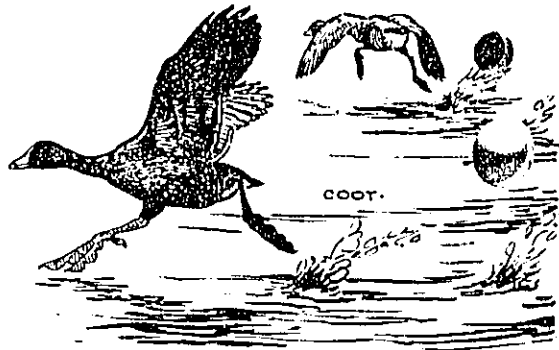
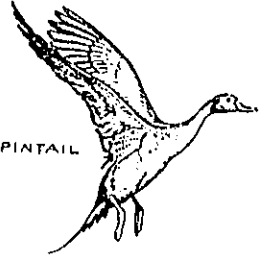
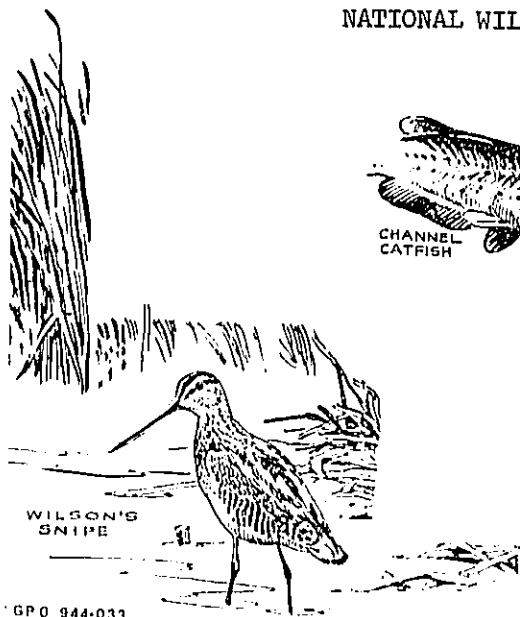
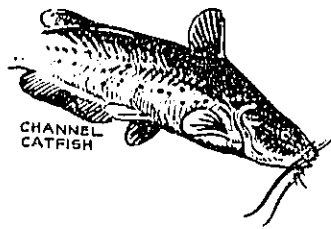


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I. GENERAL

A. Introduction

Swan Lake National Wildlife Refuge is an area of 10,670 acres in the floodplain of the Grand River near its confluence with the Missouri River in north-central Missouri. This section of Missouri is described as the upland plain or prairie region. It is rolling country with many small streams. Run-off is rapid except in the flat floodplains of the larger rivers which are highly subject to flooding. Much of the floodplain areas have been enclosed by levees, cleared of timber and are being farmed. Old oxbows and depressions in unleveed sections form many marshes and ponds.

On the refuge, water held in three shallow impoundments covers about 5,000 acres. Some 2,700 acres are farmed, and about 1,000 acres are maintained in permanent grass. Approximately 1,500 acres bordering two natural drainages are covered with low-grade bottomland timber. It is not uncommon for 75 percent of the refuge to be inundated by flood waters several times a year.

Located within a large agricultural area, the refuge and surrounding farms attract the largest wintering concentration of the Eastern Prairie Population of Canada geese in the Mississippi Flyway. Flyway objectives call for a post-season population of 200,000 Canada geese. The majority of these birds winter on and in the vicinity of the refuge.

B. Climatic and Habitat Conditions

Average annual precipitation is 38.27 inches. In 1977, precipitation amounted to 42.54 inches. Subsoil moisture and water levels seem fully recovered from the abnormally dry conditions of last year when precipitation totalled only 27 inches.

The year began and ended with unusually cold, harsh, winter weather. In January and February a foot or more of snow was drifted and redrifted by strong winds closing highways and byways isolating rural families for as long as a week at a time. Subzero temperatures were the rule rather than the exception falling as low as -20°F. The majority of the geese "went south" leaving a flock of 25,000 or fewer on the refuge during the worst weather.

Winter weather returned in early November when a cold snap froze the water and sent pintails, wigeons, gadwalls, and coots "south". Winter storms near the end of November and December held the area ice and snow bound through the end of the year.

A cool, windy March blew waterfowl through the area in a hurry. It also dried the soil permitting an early start of farming operations. Favorable weather for farming continued into August. Beginning about mid-August frequent and heavy rains hampered wheat plantings. The last acre of wheat was finally planted September 9. By September 13, all but a few acres were under flood waters and some 900 acres were reseeded aerially beginning September 22. This added to the expense of farming, resulted in poorer stands of wheat, and was so late it had no chance for growth prior to being devastated by geese. Wet weather continued to plague on into November. Goose season opened October 25, with flood waters inundating 20 blinds on the refuge. With 20 blinds not available "dry" blinds had to be refilled to accommodate hunters with reservations. It was not until November 12, that all blinds could be used, and the "on-refill" regulation reinstated.

Off the refuge crops were planted early and production was good. Most of the fields were harvested by the time the flock reached 100,000 geese. Wet weather hampered fall plowing, so a lot of waste grain was available to the geese. Snow covered the ground prior to the end of the hunting season which reduced the potential for depredations on winter wheat by geese.

C. Land Acquisition

1. Fee Title

A report was submitted detailing round-out and inholding areas to be acquired if sufficient BLHP funds are available. No further action has been taken.

2. Easements

Not applicable.

D. System Status

1. Objectives

Refuge outputs most out of alignment with approved objectives are Interpretation and Education. To bring these outputs in

alignment with objectives it was proposed to hire an Outdoor Recreation Planner and construct a visitor contact station under BLHP. An Outdoor Recreation Planner was selected, but declined the position at the last moment. This delayed filling the position until 1978. The visitor contact station is scheduled for funding late in fiscal year 1979 or early in fiscal year 1980.

2. Funding

Fiscal year 1977 funding:

Fiscal Year 1976 funding:

| Sub-activity | Planning Allowance | Planning Allowance |
|--------------|--------------------|--------------------|
| 1210 | \$127,653 | \$119,000 |
| Rehab | 53,000 | |
| 1220 | 1,000 | 1,000 |
| 1230 | 4,000 | 4,000 |
| 1240 | 26,200 | 13,500 |
| 1400 | 300 | 250 |
| Total | \$212,153 | \$137,750 |

Rehabilitation funds used to replace old, wornout, inefficient farming equipment (\$37,456) and regravels the entrance road (\$14,860).

Manpower pattern is as shown on first page.

II. CONSTRUCTION AND MAINTENANCE

A. Construction

A severe flood occurred in October 1973, causing considerable damage to levees, roads, fields, and crops. Construction to repair damages plus measures to mitigate damages by future floods were started this year. Damage repair work includes earthwork and riprap protection of levees 2 (South Pool), 3 (Silver Lake), and 4 (Swan Lake). Mitigating measures include changing the location of Silver Lake emergency spillway to reroute flood waters away from some 750 acres of cropland. Construction of a training dike in conjunction with the new spillway to protect another 450 acres of cropland. Reworking a transfer ditch to allow better management and use of water. Installation of three additional water-control structures. Unfortunately, the \$390,000 flood damage money is not enough to complete the project. Priorities as to which elements will be included depend upon costs of the various elements, and have not been fully decided as yet.

A new tractor, 8-row planter, 8-row rotary hoe, and three, 8-row cultivators were purchased for \$37,456 to replace wornout 4-row equipment to improve efficiency and increase production. Obviously, 8-row equipment will do much more per hour than will 4-row equipment. This will facilitate earlier planting which usually increases yields.

B. Maintenance

As per the Annual Work Plan Advice the exterior of the silo observation tower was painted to improve its appearance. A circular, steel stairway was purchased to improve the safety and appearance of the interior of the tower. Unfortunately, the \$5,000 rehab money was not enough to cover both the purchase and installation of the stairs, so as yet installation has not been accomplished.

C. Wildfire

No wildfires occurred on the refuge.

III. HABITAT MANAGEMENT

A. Croplands

Some 1,850 acres were farmed by refuge personnel, 750 acres by Missouri Department of Conservation personnel, and 100 acres by one permittee. Refuge farmed crops were 600 acres of corn, 700 acres of grain sorghum, and 550 acres of wheat.

The acreage planted to corn was fertilized according to soil tests to yield 100 bushels per acre. Although it was planted early enough and the weather was favorable for such production, a severe infestation of corn root worms reduced the yield to average 50 bushels per acre. Root worms were a problem to farmers throughout the area but few experienced infestations as severe as the one which occurred on the refuge. Recommended remedies are crop rotations and insecticides. These will be tried in 1978 to forestall another such disaster. Fertilizers, herbicide and seed for the 600 acres of corn cost \$27,962.52. Because of root worm damage about 80 percent of the corn stalks lodged. This made it highly attractive to the geese and was probably a major factor in reducing the kill at least in the early part of the season. This could be considered a plus. That the yield was reduced by 50 percent would have to be considered a minus.

Grain sorghum was again planted without benefit of fertilizers, herbicides or insecticides yet produced an average of almost 80 bushels per acre. Sorghum plants are subject to root worm attack, but not nearly as severely as corn, and also, sorghum seems better able to withstand the attacks. Sorghum will be used to rotate with corn in 1978. Geese accept sorghum as readily as corn, and mallard ducks greatly prefer it. Sorghum seed cost \$1,450.

Missouri Department of Conservation personnel farm about 750 acres within the public hunting area. All 750 acres were sown to wheat. State personnel also helped refuge personnel with the refuge farming operations.

One permittee farmed 100 acres of which 60 acres were corn, 20 acres in sorghum, and 20 acres of clover. The refuge's share amounted to 20 acres of clover, 12 acres of corn, and four acres of sorghum.

Some 690 bushels of wheat were received from DeSoto NWR. This wheat was needed to reseed the 900 acres that had been flooded in early September. The refuge furnished the seed and the State shared the cost of aerial seeding. Trucking costs were \$207.15 and the refuge's share for aerial seeding was \$2002.50.

Farming for wildlife and particularly for geese is an established and proven practice. Farming is considered the single most important program at Swan Lake NWR. It provides for the geese and almost all outputs are contingent upon the geese.

In 1977, 85,000 bushels of grain and 50 tons on green browse were produced on the refuge. This translates into about 11 million goose-use days, and was less than half enough food to support the Eastern Prairie Population of Canada geese that returned to the Swan Lake Area.

B. Grasslands

Neither haying nor grazing occurred on the refuge. Grasslands amounting to about 600 acres were mowed to provide browsing areas for geese and to retard brush encroachment. For over a month thousands of geese fed and loafed in one 30-acre field of clover.

C. Wetlands

Water levels within all three impoundments had to be managed more to facilitate construction than for habitat but habitat quality suffered very little. About 1,000 acres of moist soil vegetation were produced and reflooded for waterfowl. To facilitate construction Silver Lake was to be held below 665 m.s.l. and Swan Lake below 654.5 m.s.l. This was accomplished except in late August and early September. Attempting to maintain these levels required maximum discharges which caused flooding on about 500 acres of crops, mainly wheat. It also caused flooding of four hunting pits. Construction of the new emergency spillway in levee 3, and reworking the water-transfer ditch made it necessary to hold the water levels so low in the two impoundments. Because all water discharged from the refuge must pass through the South Pool control gates it is necessary to lower South Pool as well.

D. Forestlands

Nothing to report.

E. Other Habitat

Nothing to report.

F. Wilderness and Special Areas

About 1,000 acres of bottomland timber have been designated as a Natural Area. Water flowing over the new emergency spillway will also have to flow through a portion of the Natural Area to enter Yellow Creek. This was of some concern to personnel of the Missouri Department of Conservation who feared a loss of bottomland timber through increased silt deposition. This possibility is very remote, but the Service agreed to monitor the situation. This bottomland timber is flooded many times each year by Yellow Creek, a silt-laden tributary of the Grand River, with no apparent detrimental effects.

G. Easements for Waterfowl Management

Not applicable.

IV. WILDLIFE

A. Endangered and/or Threatened Species

Nothing to report until classification of the northern bald eagle is classified, and even then there may still be nothing to report.

B. Migratory Birds

1. Waterfowl

Autumn and winter population figures are obtained from aerial censuses by Missouri Department of Conservation waterfowl biologists. Reliability of these data for geese is considered very good and within Reliability Class B. Ducks and coots are more difficult to census from the air than are geese. At Swan Lake NWR, however, impoundments have little vegetation to conceal these birds, and a low percentage of ducks and coots are hidden from view. Consequently, the reliability of population figures are considered good, but probably still fall to Reliability Class C. At times ground counts and photography supplement aerial censuses.

Beginning with the 1970 hunting season the high harvest states of the Eastern Prairie Population of Canada geese accepted restricting harvest regulations to increase the flock to a post-season level of 200,000 birds. The following table is quite convincing that hunting plays an important role in population levels.

| <u>Year</u> | <u>Peak Population</u> |
|-------------|------------------------|
| 1969 | 110,200 |
| 1970 | 113,000 |
| 1971 | 160,500 |
| 1972 | 155,200 |
| 1973 | 163,100 |
| 1974 | 170,200 |
| 1975 | 196,000 |
| 1976 | 211,400 |
| 1977 | 269,700 |

Although more Canada geese concentrated in the Swan Lake Zone than ever before, hunters failed to harvest the quota of 25,000 by 5,433 geese in a 69-day season. The reasons for this are two-fold. First, the geese fed very little in refuge fields prior to the opening of the hunting season. Consequently, there was "plenty" of food available to them on the refuge to carry them through much of the season. Usually the reverse is true. The geese "clean" the refuge upon their arrival and are then forced to forage off the refuge during the hunting season. Obviously this makes them much more vulnerable to hunters. Second, the buildup of the flock was much slower than usual. The flock remained at about 100,000 to 125,000 Canada geese until the end of November, and the peak of 269,700 Canada geese was not attained until the end of December.

Banding quotas for Canada geese were for 500 immatures or 2,000 geese total, whichever is attained first in both pre- and post-season programs. A total of 1,411 geese of which 477 were immatures were banded in the pre-season period. In addition, 257 experimentals were banded and 41 placed in pens to facilitate a special study. In the post-season period a total of 2,354 geese of which 482 were immatures were regularly banded. In addition, 480 experimentals were banded.

Swan Lake Zone has been designated as a "steel shot" area beginning in 1978. And about time. A YCC project to measure the amount of spent lead shot available to waterfowl indicates about 25,000 per acre which is more than five times the amount considered critical. Further, during a cholera scare 24 carcasses were submitted to the National Fish and Wildlife Health Laboratory and death was attributed to lead poisoning in 15 of them, and livers of 21 of them showed lead.

For the first time in about five years two whistling swans stopped at the refuge and one was shot. The wounded bird was taken to the University of Missouri for treatment and recovery. Prognosis is that it will live, but will not fly again.

Conditions were favorable for ducks until about the end of October when a cold snap moved all but mallards farther south. Even with favorable conditions the duck population remained below normal. This is attributed to the high water conditions that encouraged dispersion rather than concentration.

2. Marsh and Water Birds

For the past three years the peak population and period of use by white pelicans have declined. This is attributed in part to two severe winter kills of fish in 1975 and 1976, which greatly reduced their food source.

Black-crowned night herons are uncommon visitors. A rise in water levels in August that flooded shoreline vegetation, however, created habitat that attracted about 100 of these birds along with many other herons and egrets.

3. Shorebirds, Gulls, Terns and Allied Species

Nothing thought to be of significance or unusual to report.

4. Raptors

A large wintering population of Canada geese attracts many raptors to the refuge. Bald eagle numbers varied from 50 to 100 from October through February. Although they sometimes harass the waterfowl they seldom kill any. They seem content to feed on carcasses of geese that died from other causes. Usually fewer than five golden eagles winter on the refuge, but hawks outnumber eagles about five to one.

Two bald eagles were shot on the refuge during the goose season. One was killed, the other was taken to the University of Missouri for treatment and rehabilitation. As of now it seems doubtful that it will be able to fly sufficiently well to be released to the wild.

Fourteen bald eagles were banded and marked, 12 of the 14 had transmitters placed on them to facilitate an eagle-waterfowl relationship study.

5. Other Migratory Birds

Nothing of significance noted to report.

C. Mammals and Non-Migratory Birds and Others

1. Game Mammals

White-tailed deer, cottontail rabbits, squirrels, and raccoons are classified as game mammals in Missouri. None of these may be hunted on the refuge. The refuge, however, is the population center from which deer annually

repopulate the surrounding area. As such it is recommended that the refuge remain closed to hunting. Over the past several years the herd has varied between 300 and 600 head. In 1977 the peak population was about 450 deer.

No change has been noticed in the number of cottontails, squirrels and raccoons inhabiting the refuge. Hunting and trapping around the refuge seems to be holding raccoons in check.

2. Other Mammals

Coyotes are classified as vermin and there is no closed season or bag limit in Missouri. Hunting coyotes has become popular, especially since pelts are worth about \$35 each. Still "wily coyote" persists in undiminished numbers on and off the refuge. Coyotes are economically important. Not because of the livestock they take or the value of their pelts, but because of the vast investments made in 4-wheel drive trucks and CB radios by his pursuers.

3. Resident Birds

Wild turkeys have become well enough established on and off the refuge that Chariton County will be open to turkey hunting in 1978. A timbered corridor along Yellow Creek provides the major habitat and range for the birds.

4. Other Animal Life

In 1977, the fish population was probably at an all time low because of winter-kills. Some natural restocking occurred when flood waters from Grand River and Yellow Creek entered the impoundments. Also, several large broods of bullheads were observed even prior to the flood.

V. INTERPRETATION AND RECREATION

A. Information and Interpretation

1. On-Refuge

Conducted tours were the primary vehicle for imparting interpretive information. As yet there are no self-guiding facilities meeting the criteria for an interpretive experience. Many calls come from teachers for conducted tours, but none has the time, willingness, or expertise to utilize the area for environmental education. This should

begin to change in 1978 with the employment of an Outdoor Recreation Planner to work with teachers and schools.

Some 50 4-H members from clubs throughout Chariton County participated for six Saturdays in a "Wildlife Conservation" project on the refuge. Refuge and State personnel were the leaders. Waterfowl identification, waterfowl migrations, hunter ethics and gun safety, preventing depredations, and refuge management were meeting topics.

2. Off-Refuge

TV stations from Kirksville, Mo., Columbia, Mo., and Des Moines, Io., filmed refuge wildlife and activities for special feature presentations.

B. Recreation

1. Wildlife Oriented

Fishing, wildlife observation and hunting are the major recreational activities. Fishing is permitted March 1, through September 30, daylight hours only and in accordance with State regulations. There are no restrictions on the number of fishermen per day nor the number of times a person may fish during the open period. Fisherman visits average about 50,000 per year, but was much reduced in 1977 because of poor fishing success and because Silver Lake levee was closed by construction.

Wildlife observation attracts the most visitors with October being the peak month. In October the weather is pleasant and the geese are here. The drive to the observation tower, open 365 days a year, traverses the dike which impounds Swan Lake. The entire lake with thousands of active waterfowl is in full view. During the fishing season people interested in birding and other wildlife observations may drive or walk through the refuge during daylight hours at their pleasure. A favorite pastime is to drive through in the evening to observe the deer.

Hunting on the refuge is a closely controlled activity. Geese only may be taken. The number of hunters is restricted. A lottery determines who gets reservations, when, and in which blind. A maximum of ten shells per hunter may be fired. Only one Canada goose per hunter per day may be taken, but other species of geese may also be taken within legal limits. Hunting on the refuge also

provides a quality hunt. Blinds are well spaced, are isolated from each other, have a minimum of interference from other hunters and refuge activities, and hunter success is high. Over the past several years from 4,000 to 7,000 hunters hunted on the refuge. In 1977, 10,692 hunters took 5,175 Canada geese, 119 snow geese, and 15 white-fronted geese. The hunt is administered by the Missouri Department of Conservation.

2. Non-Wildlife Oriented

Nothing to report.

C. Enforcement

A minimum amount of enforcement work is conducted by refuge personnel. Swan Lake NWR is not in close proximity to any large cities. Activities that attract large crowds such as swimming, boating, camping, and picnicking are not permitted nor demanded. The refuge just does not lend itself to these activities. Further, hunting and fishing are well monitored by State Conservation Officers.

VI. OTHER ITEMS

A. Field Investigations

An eagle-waterfowl relationship study in cooperation with the Missouri Cooperative Wildlife Research Unit is in its fifth year. Progress reports are included in the Unit's quarterly reports. Almost 30 eagles have been marked and transmitters placed on 24 of them in the course of the study. To date, findings are still somewhat inconclusive.

The second summer of field investigation concerning "Radio Telemetry Studies of Off-Territory Behavior of Mourning Doves Related to Call-Count Survey Evaluation" was completed. This too is in cooperation with the Missouri Cooperative Wildlife Research Unit. No final report has been received. Progress reports are included in the Unit's quarterly report.

A new study entitled "Crop Depredation by Waterfowl in North-Central Missouri" was initiated in October. This is the only on-going study on the refuge that carries a Service monetary grant. Estimated costs of this two-year study is \$26,200, of which the Service contractual costs are \$9,800. The Missouri

Cooperative Wildlife Research Unit and the Missouri Department of Conservation are the other contributors. The objectives include quantification of crop damage by geese, relate activities of geese to proximate factors of crops, and long-term management techniques to alleviate depredations problems.

B. Cooperative Programs

This was the second year for a YCC program at Swan Lake NWR. It was a non-resident camp of 20 enrollees and five staff members.

Enrollees came from 10 towns. Some traveled as far as 40 miles each way to participate. One of the major undertakings was to construct a one-acre pen with four divisions in which geese would be held for the Crop Depredation Study. The camp was considered a success and an improvement on the first year's camp.

C. Items of Interest

Assistant Refuge Manager Keck completed 40 hours of Supervisory Training in Kansas City, Missouri. He attended a one-week training session for YCC in Petit Jean State Park, Arkansas. Following this training he was detailed for a week at Union Slough NWR to help get that YCC program started. Upon his return he went on active duty with the National Guard for 15 days. On August 2, Mr. Keck departed to take up duties as a Special Agent in the Service's Division of Law Enforcement. The assistant refuge manager's position remained vacant through the end of the year.

Biological Technician Hull and Tractor Operator Milligan each completed 40 hours of law enforcement training in August in Denver, Colorado. Although both were told they passed the course no official notification nor credentials have been received.

D. Safety

No lost-time accidents occurred during the year. It has been 4,639 days since a lost-time accident has occurred at this station.

Defensive Driver Training, an eight-hour course, was completed by all employees as well as the YCC staff.

Almost every regular safety meeting included a film from the mining industry. These films presented situations quite similar to those encountered on the refuge, and the accident prevention techniques shown in them are adaptable. Film subjects included first aid, proper lifting, moving equipment, color coding, protective clothing, protective machinery guards, teach safety, and think safety. It hurts to get hurt.